

SPECIES IN AGAVE.

(PLATES XXXII AND XXXIII.)

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As Dr. Gray once said, species are nothing but human judgments (he even added very fallible judgments as some of us know to our sorrow), and as such they have changed and may be counted on to change with the minds that frame them, oscillating about the truth in a series of approximations to a definition of the also—but less rapidly—changing forms of living nature. A glance at the work of their makers shows that they have always been obscured by insufficient knowledge of real differentials, and even in the masterly synopses of Linnaeus and other epitomizers too few of them have usually been known to permit characters to be so framed as unquestionably to exclude those to be revealed by the exploration of new regions or by closer study at home. Botanists have rarely been able to build on the work of their predecessors without frequent reference to more than original descriptions, and in their effort to fix types they have been more helped by that uninspiring accumulation of dried plant remains, the herbarium, than by anything else unless indeed it be a well done illustration showing a pre-specific existence of a species—if such an expression may be used notwithstanding a sometimes handy convention that species are not to be sought earlier than the date of their formal binomial christening by the great Swedish naturalist.

Succulents have offered rather more than their share of trouble to those who have undertaken to describe and classify them, for one reason because they usually are, or appear to be, difficult of preservation in the herbarium. The fallacious notion, that, being easily brought in alive so that they may be grown in gardens, they are more surely preserved in this way for reference, may have had something to do also with damping the ardor of herbarium makers.

To this circumstance is attributable the fact that many species of this kind of plants have been described from garden specimens which have disappeared sometimes almost before the ink was dry on their descriptions, and that these have been drawn in many instances necessarily from easily transported rather than representative material. Very naturally, too, garden plants claiming specific recognition in a study of this kind have been accounted for though absolutely nothing was known of their source or origin; and descriptions are sometimes not free from at least the suspicion of being based on foliage of one species—possibly warped in character to ease its assimilation with an earlier description, flowers of a second, and possibly fruit of a third,—superadded in a laudable effort to complete the original account of a vegetating type, itself long lost.

Agave stands well to the front among genera exemplifying these difficulties, and it presents some that are almost its very own, because of having enjoyed a marked if transient garden popularity a little over a generation ago. Linnæus, in 1753, named only four species, two of which are now accredited to other genera. Twenty-five years ago, after excluding a large number of nominal species, Mr. Baker admitted 127 true agaves; and more than 200 species, of which many are nondescripts, must now be admitted to even a conservative list. Over one third of those recognized by Mr. Baker were based on vegetating plants—and on garden specimens at that; and most of the many others that he relegated to a synonymic place, as well as those that he had to lay aside as unidentifiable, had been described from garden plants, often of only a few years' growth.

In a study of the genus to which I have been devoting such time as could be spared for the last ten years, an effort has been made at once to understand the spontaneous representation of this genus—characteristic chiefly of the Mexican plateau, and to exhaust all possibilities of identification with nominal garden species before accepting as new to science even the most striking form met with in nature. During the fad for cultivating agaves, beginning about forty years ago, large prices were sometimes paid for good specimens. Although dealers and collectors never showed an undue zeal

to reveal the location of the mines from which they were drawing wealth, the fact that the traffic was large and profitable is responsible for the preservation of some disjointed scraps of information that may now and then be pieced together into clues that show where some of the most extensive and varied collections were made, and thus indirectly ensure reference to wild plants for species based on long lost garden specimens. It is with no small satisfaction that by means of such a devious argument I have been able to follow in the footsteps of the collector Roezl, and to understand at least a part of the species of his collecting that had otherwise passed into troublesome uncertainty; and no opportunity has been missed to examine the precise locality indicated as having been visited by botanists whose writings or collections have entered into the history of the genus—as, for instance, the lava beds on which Schiede found one of its most persistent stumbling blocks, *Agave lophantha*, and one of its good but long-discarded other species, *A. obscura*.

In such a study, essentially an honest effort to see and account for the forms actually presented by nature, so that others may see and know them, one must always be moulded by the times that he lives in. If unable to apply a unit-character criterion in discriminating between species, I find myself equally unable to adopt so broad a gauge for their measure as to join under one name the manifold West Indian forms in which so good a botanist as Grisebach could see only the century plant. I find, however, that in these plants, long-lived, slow-growing, and even in the field most commonly seen only in their vegetative dress, a successful study calls for attention to minutiae that, being unnecessary for segregations in most groups, receive there less attention than they really merit, and are often looked on with suspicion when used. Ascertaining the stability and significance of these proves at once a fascinating and disturbing part of the study.

In fruit, flower, pedicel, bract and scape characters, the agaves do not offer variation or differentiation very unlike what is usual in other genera of equal range and size; but in many cases in which such characters are still unavailable, those drawn from the leaves, and utilized in the description of species from young garden

specimens a generation ago, prove, within limits, entirely dependable. A few illustrations—from very many that might have been selected—will render this clear:

If the end-spine of *Agave americana*—as it occurs in our gardens everywhere, green, striped, yellow-margined or yellow-centered—had been attentively studied years ago, as it has been recently, in comparison with that of the now almost equally common yellow-margined *A. picta*, the former species would never have been made to include the latter (Pl. XXXII.). The spines of gray henequen (*A. fourcroydes*) and green sisal (*A. sisalana*) supplement other characters in segregating these constituents of what is still too often called *A. rigida*; and in this respect *A. angustifolia* differs so greatly from either as to make one who knows the differences wonder how, under whichever of its aliases it was encountered, it ever could have entered into this same modern complex called *rigida* (Pl. XXXII.). Three groups—superspecies, they might be called—of the now economically interesting zapupe agaves are distinguishable from one another, even to the touch, in this same character (Pl. XXXIII.),¹ and each group falls into species on its marginal arming. The likewise important group of mezcals grown for the production of Tequila spirits, known to science in one compositely described species (*A. tequilana*), shows a similar differentiation into an even greater number of forms (Pl. XXXIII.); and many of the great maguey forms grown all over the Mexican tableland for the production of pulque are unmistakably distinguishable on their spine and prickle characters.

These examples, I trust, may justify the devotion of a somewhat lengthy prologue to the argument that small things are not to be despised; or to a short epilogue drawing the conclusion that the arming of an *Agave* is no less significant in species discrimination than the disarticulation of the sepals of an apple, and that, in fact, neither stands alone.

Until within very recent years, few herbaria have possessed more than one or two leaf fragments of a given *Agave*, and where more than one occurred the chances were good that they were not co-

¹ *Trans. Acad. Sci. of St. Louis*, XVIII., no. 3, May, 1909.

specific, even if either of them might properly bear the name attached to it. Jacobi clearly saw the value of spine characters in this genus, in his study of its representatives in the garden collections of his day, and he applied them as consistently as he could in his descriptions; but unfortunately the material on which these were based was often immature and the descriptions are too frequently generalized. Of the many illustrations of *Agave*, sometimes exquisitely colored, almost none approximates the truth in these details any more closely than a studio-made volcano approaches the true declivities of its cinder-cone and foot-slope. Notwithstanding all of its defects—some of them very real and serious—photography now ensures the truthful picturing of minutiae that the eye of the describer may mistake and the pencil of the delineator is quite likely to misrepresent. Even by its aid, however, part truths may appear as truths, and a real fact may enter as an unreal specific character. It is for this reason that my own conception of specific identities and differences in this genus oscillates as my study proceeds: the leaf characters of a first specimen being most commonly ignored until more and different material forces their recognition; but with increasing evidence that, chosen from mature leaves of adult plants, and used with judgment, they are dependable.

Obviously, no species in any group can be considered as fully defined until all of its characters are known; and no species is satisfactorily described until its characters have been tersely brought together in contrast with those of its allies, as is painfully evident whenever a new form is confronted with published descriptions, which may be equivalent to saying that no species can be satisfactorily described until all of its closely related congeners are known. Obviously, too, species based on incomplete material are more likely to prove capable of ultimate subdivision than those of which all characters are represented when the first description is drawn; and in placing reliance on minutiae, more than the usual need exists for using these with the judgment derivable only from experience, and for selecting with the greatest care their adult state. With such care, and subject to these restrictions, the species of this difficult genus, even in their vegetating form, appear to be capable

of clear delimitation; and in their essentials they show evidence of being much less mutable than they are commonly supposed to be when judged by the impression that they make on the untrained eye, or when differences in habit are given undue emphasis.

EXPLANATION OF NATURAL-SIZE ILLUSTRATIONS OF AGAVE SPINES.

PLATE XXXII. A, Three spines of *Agave americana*. B, Three spines of *A. picta*. C, Three spines of *A. sisalana*. D, Three spines of *A. fourcroydes*. E, One spine of *A. angustifolia*.

PLATE XXXIII. F-J, Two spines of each of the "zapupe" agaves: F, *A. zapupe*; G, *A. Deweyana*; H, *A. aboriginum*; I, *A. Lespinassei*; J, *A. Endlichiana*. K-N, Spines of Tequila mezcals—two each except the lowest: K, "azul"; L, "ziguin"; M, "mano larga"; N, "Chato."